

## **EXAMINERS' REPORT**

*Specimen Paper 2*

### **Subject F108 — *Health, Social, and Employee Benefits* Fellowship Principles**

#### **INTRODUCTION**

The attached report has been prepared by a group of actuaries with experience in the subject area as well as experience as examiners and principal examiners. In many cases, the report reflects the published examiners' reports from the original F101 and F104 examinations. The solutions provided are an indication of the points sought by the examiners and should not be taken as model solutions. We have chosen to show detailed mark allocations as we would have applied them as we believe this will help candidates to see how the new principles in the new syllabus can be used to generate marks. Unless otherwise indicated, each bullet represents a  $\frac{1}{2}$  mark. Lines of text without bullets would not gain credit.

## QUESTION 1

*[The suggested solutions for each part are taken unadjusted from F104 June 2021.]*

i)

- There is a large risk related to the time at which the investment returns are earned on fund assets.
- Compared to when they are allocated to member balances.
- If actual returns turn out to be persistently lower than the monthly growth allocation.
- Then members that exit within a financial year will receive too high an allocation of return.
- That also reflects the over allocation of returns made to exits.
- While members still active at the financial year end will likely experience a negative bonus allocation.
- Effectively creating a cross-subsidy from stayers to leavers, which is generally considered unfair. /i.e. the final bonus allocation will be even lower than the actual fund return to compensate for the additional return paid to exits.
- The alternative to having a negative bonus at the year-end is for the fund to become underfunded.
- This is unlikely to be a viable option for a DC fund.
- Any deficit would have to be recovered from future investment returns.
- That should really belong to active and joining members.
- If actual returns turn out to be persistently higher than the monthly growth allocation.
- Exiting members will not receive the full return that is due to them.
- This is not equitable across members since exits will have shared completely in the investment risk until their exit date.
- Alternatively, a surplus could be allowed to build up in the fund due to deliberate conservatism in bonus declarations.
- To be distributed to members and former members at the end of each year.
- However, this exercise will introduce additional costs and administration requirements.
- There is also the risk that final bonus calculations are incorrect.
- Which leads to similar problems as described above.

ii)

- The valuation report can identify the risks and make formal recommendations to mitigate them.
- Valuations can be done more regularly (for example quarterly or monthly).
- To ensure that returns are being more frequently distributed to members.
- However, there will be a time lag between the end of the period and the valuation.
- Which means intergenerational transfers are still not eliminated.
- This may increase the costs of running the fund.
- The valuation could incorporate a contingency reserve.
- That is earmarked to smooth returns over time.
- A reserve will protect members from significant fluctuations in their retirement savings balances.
- And will protect the fund's solvency.
- Members should receive a proportional share of this reserve at exit to ensure fairness.

across members.

- The valuation can be used to identify more specifically the causes of volatility in the fund (for example an inconsistent investment manager).
- And the trustees can take action on that basis.

## QUESTION 2

(i)

- Both are accrued benefits methods.
- Which target a standard level of funding.
- With the StCR being set to maintain this target over the control period.
- For both funding methods the StCR can be modified for surpluses or deficits.
- The actuarial liability for both methods takes into account all benefits accrued at the valuation date.
- But the PUAL is based on projected final earnings (at retirement date).
- Whereas the CUAL is based on current earnings.
- The SCR takes into account service accruing over the control period in both methods.
- However, the PUSCR consistently references projected final earnings.
- Compared to the CUSCR references projected earnings only to the end of the control period.

(ii)

- The CUM will produce an StCR that is lower than that corresponding to the PUM.
- This is favourable to the employer who may be unable to afford the current level of contributions.
- The actuarial liability under the CUM is always lower than that corresponding to the PUM.
- The fund is fully funded which means a surplus will arise as a result of changing the method.
- This means the MCR the employer would have to pay is even lower.
- Allowing for more capital to be invested in the business with the hope of improving the financial position.
- The surplus funding position is favourable to the employer because the surplus in a DB fund is likely to reflect on the employer's balance sheet.
- And give the illusion that their financial position has improved.

### QUESTION 3

i.

- Objective will be to maximise the expected return
- Net of fees and tax
- Subject to an acceptable degree of risk/subject to the risk appetite or budget of the insurer
- And all regulatory constraints such as proscriptions and prescriptions
- A matched strategy carries the least risk
- Where matching is by nature, term
- Currency and amount
- And any deviations from this are subject to free assets

*[An alternative structure would be to use a matched position as a starting point and then to discuss reasons for deviation]*

ii.

- This is an immediate annuity
- purchased by an impaired life requiring long-term care.
- It provides regular payments guaranteed throughout the annuitant's lifetime,
- and thus provides protection against the uncertain survival duration.

iii.

Currency

- Liabilities denominated in local currency so international assets not necessary

Nature

- Liabilities relate to inflation-linked annuities in payment...
- ...the claims are likely to be subject to material levels of medical inflation if product offers indemnity cover
- Payment of liabilities starts immediately, so some need for cash investments to meet this outgo
- Ongoing liquidity to meet continuing expenses
- No future inflows as single premium policy

Term

- Established book of business likely to have average term of around 5-6 years
- Thus longer term assets should also be considered

Uncertainty

- Uncertain survival duration, so some longer-term investments also appropriate, given that they are sufficiently liquid to realise as and when required

## QUESTION 4

i)

- $RP_x = SA * ix * rx$  Where:
- $SA$  = Sum assured,  $RP_x$  = Risk premium for a life aged  $x$
- $ix$  = incidence rate across all conditions (sum of individual incidence rates) for age  $x$
- $rx$  = probability of surviving the survival period; i.e. the 28-day survival rate given a diagnosis of a CI for age  $x$

ii)

- Contingency margins
- Expense loadings
- Commission
- Contribution to profit
- Discount rate
- Solvency capital requirements
- Cost of capital
- Reinsurance loadings
- Adjustments for any costs of guarantees
- Assumptions around volume of business (for spreading overheads)
- Assumption around mix of business (where cross subsidies exist)

iii)

- Incidence rates
  - May increase over time, resulting in more claims than expected
  - Greater awareness; early detection; diagnostic technology improvements
- Survival rates
  - Higher than expected, resulting in more claims than expected
  - Mortality and treatment improvements over time
- Both of the above particularly a problem if rates offered are guaranteed, which is often the case,
- and the product is long-term, exacerbating this risk
- Competitive risk
  - Risk that competitors design and market a similar product which is found more attractive,
- Low marketability of product
  - Not found attractive by target market – low demand
  - Or competitors launch a more attractive product
  - Low appetite for intermediaries to market
  - resulting in low business volumes (difficult to cover overheads)
  - or lapses (which is problematic if the asset share is negative) resulting in losses
- Take-up by the lives not intended
  - Mis-selling risk if commission out of line with that of competitors
  - i.e. higher. May sell to persons for whom product does not meet needs in order to get commission
  - Reputational damage if product does not meet needs and found to have been mis-sold.

- Anti-selection – insurer’s underwriting may be inadequate to pick up on certain forms of
- anti-selection/moral hazard – results from genetic tests, family history, other risk factors
- May be exacerbated for a stand-alone policy such as this
- Element of regulatory risk if certain forms of underwriting no longer allowed
- High take-up can result in capital strain
- And administration problems
- Selective lapses
  - Healthy lives lapse policies, leaving the insurer with a greater concentration of policyholders who are more likely to claims

## QUESTION 5

i.

- Business is loss-making
  - Greater utilisation of benefits than expected (e.g. supplier induced demand)
  - Average cost per utilisation higher than expected (e.g. Medical inflation may be persistently higher than expected – new diseases, technological advances, etc.)
  - Investment returns lower than expected
  - Expenses higher than expected
  - Errors in pricing basis – claims incidence/frequency being under-estimated
  - Underwriting errors – assigning the incorrect premium to groups of lives.
  - Fraud, wastage or other inefficiencies resulting in losses
- Growth in business – greater new business strain
- Regulatory changes on minima/maxima, reserving requirements, etc.
- Consistent internal strengthening of bases
- Counterparty failure e.g. failure of a reinsurer
- If the solvency capital levels have been historically very high, a conscious decision by management may be to gradually reduce this to a more capital efficient level by utilising the capital to grow the business or pursue other more lucrative opportunities

ii.

- Ideally, would need to analyse the experience w.r.t. *all* the various items that could drive the observed trend (not just those related to the risk profile)
- It is likely that it is the conflation of multiple items that is driving the experience – some more so than others, and potentially in opposite directions.
- This is why an AOS-type exercise to investigate all possible drivers is preferable
- Need to collect the data over the past five years
  - internal data for claims, membership, expenses, investments
  - external for general market trends, economic data, etc.
- Make sure all claims data are fully run off or allow for IBNR, outstanding claims where appropriate
- Data should be grouped following a similar methodology as per the pricing/reserving bases in order to identify the risk cells that may be driving the observed trend (or partially driving the trend)

- Changes to regulations – underwriting, etc. may have had an impact.
- Membership data should be analysed on a per beneficiary per month basis, and similarly the claims data
- Any large one-off/catastrophic events that could have contributed should be noted,
  - There may have been a large number of unusually large claims eating into the reserves over the period – these should be taken into account

Consider the following investigations:

- Claims, per category – hospital, medication, day2day, etc.
  - There may be a particular category of claims that is significantly higher than expected
  - May indicate area open to abuse/antiselection
- The overall profile of the membership should be analysed as well as the changes during the period under investigation
  - Look at the age profile over the period
  - Consider the chronic incidence over the period and whether there was a noted increase in chronicity
  - Consider the M/F split over the period
- The profile of the lives who terminated their membership also needs to be considered to discern whether there is a selective lapsing effect
- As well as the risk profile and volumes of newly covered lives
  - There may be an effect per distribution channel, hence consider the volumes and mix and lapses per channel
- An investigation into general levels of chronicity and new diseases and the industry level of medical inflation may indicate where our bases are out of line with reality.

## QUESTION 6

i

- **To encourage employees to take long stretches of leave**
- Which leads to happier and healthier (more productive) employees
- Less absenteeism
- Reduces workplace fraud.
- **This policy may be viewed favourably by prospective employees**
- Which will help the employer to attract and retain good staff.
- **The employer may be obliged to pay leave out when an employee leaves**
  - Limiting the number of days outstanding enables the employer to better plan for the cost of exiting employees
  - And to keep the cost low by limiting the outstanding days of leave.
- **Outstanding leave days are likely to be reflected as a liability on the balance sheet of the employer**
  - This policy places a cap on the balance sheet liability at any point in time
  - Which is favourable for the financial position of the employer.

ii.

- Should consider whether this suggestion is within the bounds of the labour laws.
- Employment contracts should be consulted

- to ensure there are no limitations in place with respect to retirement contributions and/or leave allowances.
- The employer should try get a sense of the employee's reaction to such a change
  - Since there will be an impact on the employer's reputation with employees
  - And potential ability to attract and retain staff members.
- The tax implications of trading one employee benefit for another should be considered
  - Specifically if there are limits to the tax breaks that can be received on retirement fund contributions.
- The trustees of the retirement fund will need to be consulted
  - Will the rules of the retirement fund will allow for it.
  - The type of fund (DB or DC) and how the conversion will be implemented should be considered
  - Additional contributions in a DB fund could create the need for complex calculations more regularly
  - Which will increase the overall costs of the fund.
- The admin capabilities of the employer payroll
- And the retirement fund systems should be considered
  - To ensure that the systems communicate well with one another
  - And no drastic upgrades are required to implement the policy.
- They need to consider alternative options before implementing – e.g. paying out in cash to employees

## QUESTION 7

i.

- $X = 99.5m / (15\ 000 * 11.2) = 592.262$
- $Y = 113.5m / (15\ 140 * 11) = 681.518$
- Year-on-year (YoY) increase 2018/2020 =  $(681.518 / 592.262)^{(1/2)} - 1 = 7.27\%$
- 2021 expected =  $1.0727 * 681.518 = R731.070$

ii.

- Total claims =  $0.75 * 244\ 160 * 845 = 154\ 736\ 400$
- Expected claim per person =  $154\ 736\ 400 / 244\ 160 = 633.750$
- Expected claim per life for 2021 =  $633.750 * 1.053 = 667.339$
- The claim projection for ImpiloMed is much lower than for TopHealth.

iii.

- TopHealth's claims cost is much higher than ImpiloMed....
- TopHealth's claims increases year on year are much higher than ImpiloMeds'
- .....on average 7.27% for 2019 and 2020 on TopHealth versus 4.65% for ImpiloMed over the same period
- Claims costs for TopHealth are much higher than CPI...
- ....claims costs increasing even though CPI is relatively flat
- Claim increases are sensitive to high-cost claims...
- ...not clear if TopHealth have any claims management in place to assist with this risk
- May be a concern of anti-selection or fraud
- Higher claims costs mean higher premiums

- ...may impact competitiveness
  - ...premiums may be too low and thus threaten the long-term sustainability
- iv.

Ways to manage claims costs:

NB: question stated unlikely to approve introducing any new benefit limits, exclusions, copayments or deductibles so no credit would be given for these points.

- **Approved provider networks...**
  - ...which restrict the choice of provider policyholders can access care via
  - and where TopHealth can have an arrangement with the provider to allow for better quality and cost of care
- **Treatment protocols...**
  - ...TopHealth can specify the prescribed treatment procedures they will cover for different conditions
  - ...This ensures lower utilization of high-cost treatments that are not needed and use of a cost-efficient approach if available.
- **Negotiated fees and fixed payments...**
  - ...this allows TopHealth to negotiate fee discounts, or introduce incentives to limit cost or allow for some risk-transfer to providers
- **Pre-authorisation...**
  - ...procedures need to be approved by TopHealth before they take place...
  - ...this allows TopHealth to ensure the treatment is necessary and complies with any protocols and/rules
- **Case management...**
  - ...will assist with monitoring high-cost cases which TopHealth's claims are sensitive to
- **Utilisation reviews...**
  - ...assist with identifying if there are certain procedures or providers that are driving the high cost increases

**Preventative measures...**

- ...if TopHealth can improve the general health of their policyholders this should lead to lower future claim incidence...
- ...which will see lower claims costs and thus lower claims increases.
- Methods to identify high-risk policyholders that are joining, for example underwriting
- Attracting younger and healthier lives with a low propensity to claim
- ....Thus reducing the overall claims cost of the book
- ...this may not be possible for regulatory reasons (e.g. restrictions on underwriting, community rating).

## QUESTION 8

### i. Definition of NDC

- A type of hybrid scheme
- Sponsored by the state
- in which a percentage of salary is contributed each year for each member.
- Benefits from the fund are set equal to the members' and employer's contributions accumulated at a rate of interest that may be predefined
- or linked to prevailing interest rates or some other index.
- They funds differ from standard DC funds in that the pool of assets may either not exist
- or may have a value that differs from the value of the accumulated liabilities.
- In this sense, NDC plans look more like DB funds from the point of view of the sponsor.

### ii.

#### **Basic notional DC – longevity risk, risk mitigation**

- Risk of pensioners living longer than anticipated
- Particularly those with larger retirement benefits
- It is possible that this risk is passed on to the active members
- If government has some latitude in terms of defining the return
- Or if the index used to accumulate notional contributions is somehow linked to longevity.
- But neither of these are very likely
- And would come with reputational risk if members felt this cross subsidy was unfair.
- Could increase the retirement age

#### **Open market option (OMO) – longevity risk and risk mitigation**

- Some members may choose the OMO which means fewer people on whom the longevity risk is retained.
- This does have a disadvantage in that it reduces the pensioner risk pool and can thus result in more volatile experience
- In addition, there may well be antiselection/selective take up of the option
- in that unhealthy lives who are able to get better annuity rates in the open market are likely to leave leaving a relatively healthy pensioner pool and worsening the longevity risk.
- Although this depends on how developed the Noricum annuity market is
- If the fund annuity is quite simple, it may attract less financially sophisticated members
- While more financially sophisticated members who already have brokers would be willing to shop around.
- The commission-saving may be most highly valued by those receiving a small pension.
- These factors may result in lower income earners choosing the fund annuity option
- These are likely to be people with shorter life expectancy
- And smaller pensions.

iii.

a.

- Multi-state modelling is used where policyholders/individuals can exist in different states, which is the case with this virus,
- each state being associated with a different set of cashflows, which is also applicable to this scenario.

b.

*[There are many, many ways to model this. Only the first 6 answers were accepted and needed to be internally consistent to gain credit.]*

- Susceptible/not immune – virus negative/healthy with no history of the virus
- Susceptible/not immune – virus negative/healthy and recovered from the virus
- Virus positive but asymptomatic
- Virus positive with mild symptoms
- Virus positive with severe symptoms
- Hospitalised (multiple hospitalised states possible e.g. ICU, specialized unit, high care, general ward)*[max 1 mark for examples of hospitalised states]*
- Dead
- Immune – not susceptible the virus

iv.

- Protecting the nation's health
  - Ensuring rapid, widespread access to vaccines, will ensure the outcome is achieved
  - Fewer people will become ill, and mortality due to the virus will decrease
- Market failures
  - Despite the good the vaccine may do for society, the company that developed it may still want to profit.
  - Meaning that mass buying power through the state is necessary to secure a reasonable price per dose./ The state may be more efficient
  - In addition, the market for vaccines usually operates at a government level and hence there is no alternative.
- Redistribution
  - In order to achieve the desired outcome, it is vital that the poor also receive vaccines, despite being unable to afford them
  - Given that the country is developing, it suggests that there may be a large poor/vulnerable population that will require subsidising from the government to receive the vaccine
- Balancing the budget
  - Limited resources available
  - Cost of vaccines plus roll-out of plan vs opportunity cost associated with declining economy and poor health outcomes
- Making good on political promises
  - Part of the campaigning would have been promises to deliver services, provide healthcare, etc.

- Need to make good on these in order to remain popular at following election
- Indeed, there may also be societal expectations.

v.

- Primary care
- Nurses/nurse aids to give the injection
- Pharmaceutical manufacturers
- Medicine distributors/logistics companies
- IT system to handle the records
- Suppliers of medical consumables (e.g, syringes, cotton balls, plasters)
- Suppliers of medical equipment e.g. for refrigeration
- Some doctors may be required to attend to people having adverse reactions to the drugs

iv.

- Initially there would be a contraction among adults,
- Particularly at higher ages
- This may serve to make the population pyramid “peak” lower but flatter.
- Net emigration is likely to increase as people try to escape the disease.
- Typically this means working age people may leave.
- The above two factors mean lower numbers of young adults which may pull the upper portion of the population pyramid to be more triangle shaped than cap shaped.
- Disease may stimulate fertility because generational wealth has been passed on so people can afford more children
- But likely to be short-lived
- But bad news and uncertainty may result in decreased fertility.
- If fertility decreases, then there will be a further contraction at age 0 which may be sustained for a while.
- If fertility increases, the bottom of the pyramid may widen again until one has a more stable (triangular) population shape.
- However, overtime as the effect of the disease weakens, the population pyramid is likely to revert to its old shape.